WASTEWATER COLLECTION AND TREATMENT MANPOWER AND TRAINING NEEDS SURVEY 1975 to 1985

In the nine-county San Francisco Bay Area

April 1975

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BAY AREA SEWAGE SERVICES AGENCY

A detailed appendix of background information for the "Wastewater Collection and Treatment Manpower and Training Needs Survey, 1975 to 1985, in the Nine-County San Francisco Bay Area", dated April 1975, is available in limited numbers to supplement this report.

If you desire a copy of the survey information appendix, please contact Bay Area Sewage Services Agency, Hotel Claremont, Berkeley, telephone (415) 548-7600.

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IN THE NINE-COUNTY SAN FRANCISCO BAY AREA

by

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APRIL 18, 1975

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ABSTRACT

This report gives the number of employees in wastewater collection and treatment in the San Francisco Bay Area by county and the projections for the next ten years. The employees are under the general headings of management, operation, plant maintenance, laboratory and sewer maintenance. A general profile, student profile, and by-county profile are included on the workforce covering age, sex, ethnic group, salary, education, previous experience and state operator grade held.

The training and education programs for those in wastewater are cataloged and evaluated covering on-job training, high school vocational education, community colleges, correspondence courses, colleges, universities and private educational institutions.

Recommendations are made for education and training to meet the demands of an enlarged, more highly skilled workforce who will be required to meet state operator certification standards. Also a program is suggested to facilitate these programs and the changes in the wastewater workforce.

PURPOSE AND SCOPE

The goal of the Wastewater Manpower and Training Needs survey was the training and education of a sufficient number of personnel to operate and maintain existing and proposed wastewater treatment facilities and collection systems. This goal was to be accomplished by a survey to find the number of employees and the present education programs with recommendations for the implementation phase of the program.

The outline of the survey criteria was to cover (1) the geographical area of the nine-county Bay Area, (2) a ten-year planning period from 1975 to 1985, and (3) all public wastewater collection and treatment agencies.

The survey was two-fold. One part was to cover the existing educational programs using the California Water Pollution Control Association and California Section of the American Water Works Association Joint Education Committee report as a basis. The report was to be updated and expanded for wastewater training programs including the institutions, instructors, program content, sources and amounts of funding. The current students enrolled were to be surveyed and the initiation of programs was to be described.

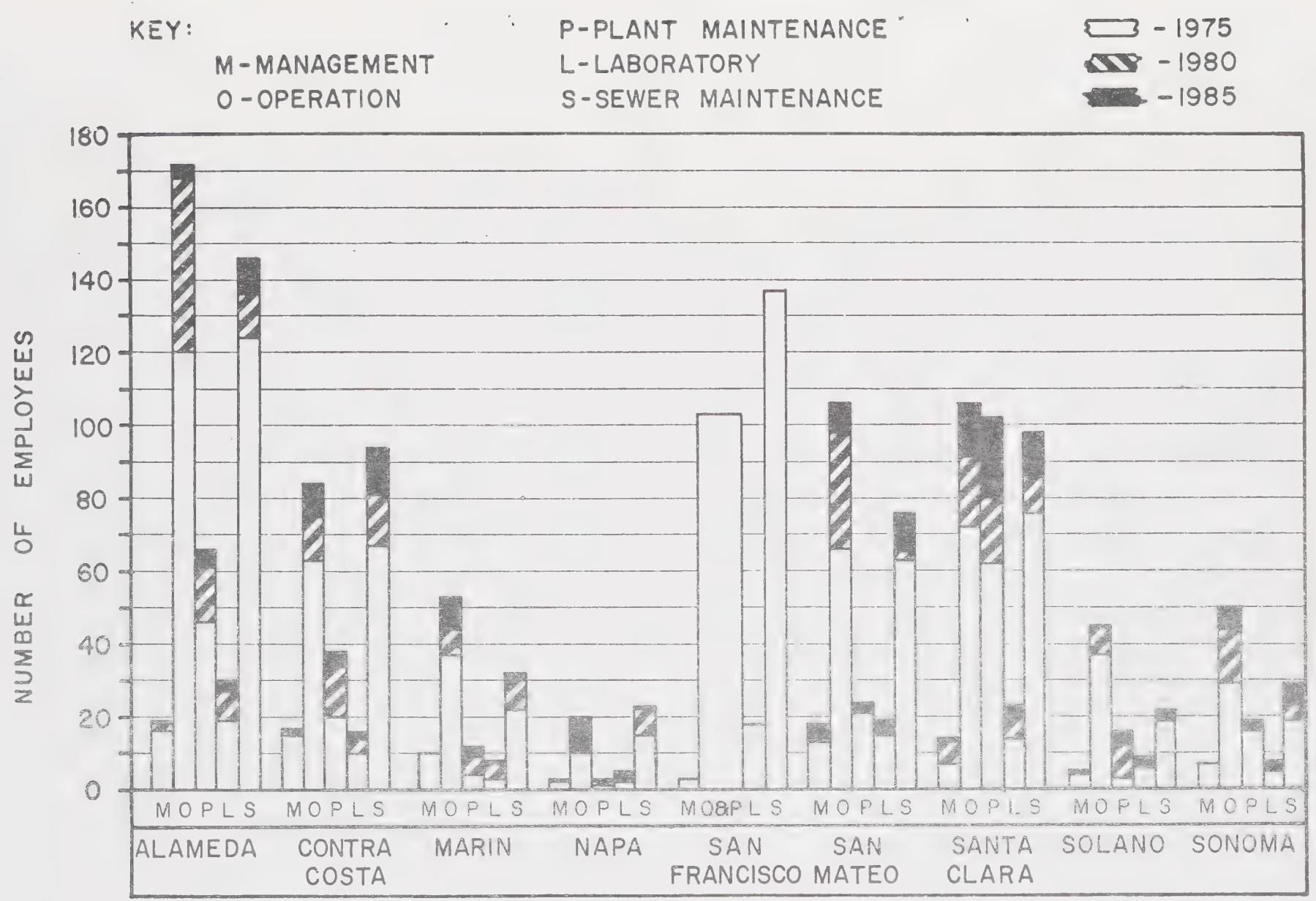
The second part of the survey was to determine the number of management, operations, plant maintenance, laboratory, and sewer line maintenance employees. This information was to be included in the state-wide survey being done by the Joint Education Committee. Also wanted were the ages, state certification grades held, time in grade, education, salary, sex, ethnic group, turnover rates and educational opportunities taken of the employees.

FINDINGS

Manpower

To determine the number of persons working in wastewater collection and treatment in the Bay Area, a questionnaire was sent out to all the responsible public agencies. The packet included a cover letter explaining the purpose and who was to be covered by the survey, a questionnaire asking for the general description of the agency and future projections for ten years, and a questionnaire asking for information from the employees. The description form was to be completed by the superintendent in charge of the collection and treatment division, and the employee form was to be completed by the employee himself or by the personnel department of the agency. Of the 98 initial packets sent out to the agencies, 6 did not respond and were called to get the number of present employees. Eight sanitary districts doing collection only and twenty city public works department were not on the mailing list used and were not covered by the survey. They were discovered from the return of the completed forms from the treatment plants. The number of line maintenance employees missed was estimated to comprise 7% of the workforce tallied. The numbers estimated are indicated on the table of the county workforce by parentheses. The number of employees by agency are in the tables in the appendix.

The projections of the workforce in the next ten years were based 40 to 75% on values from the completed survey forms. The extrapolations were based on the BASSA project coordination file and on the present number of employees. The low estimate was calculated as no change for those agencies that had no approved plans. The high estimate was based on the present number of employees with a 5% increase per year. Figure 1 shows the number of present employees and the average of the low and high estimate of the projections. The five catagories used were defined on the questionnaire to insure consistency.



WORKFORCE BY COUNTY

FIGURE 1

Training

The institutions covered in the survey of the programs for the wastewater personnel were high schools (including the Regional Occupational Programs), CWPCA, BASSA, the San Marcos Training Center, correspondence courses, community colleges, colleges, private educational institutions and universities.

A program for high school students at Livermore Water Pollution Control Plant has been in existence for three years. Students work part-time at the treatment and attend an evening course conducted by the lab technician one night a week. The other program is conducted through the adult evening school in public works in San Jose. Both courses are under the Regional Occupational Program.

The Bay Area Sewage Services Agency (BASSA) has started a Unit Process Trainer course on activated sludge and anaerobic digestion in January of this year, and will be repeating the courses each month for the rest of the year.

San Marcos Training Center has just announced that they will be offering courses in their catalog anywhere in the state for the minimum of students starting in August or September, 1975.

The California Water Pollution Association (CWPCA) - San Francisco Bay Section Professional Development Committee offers the Saturday short schools each year. Specific information is in the appendix. This year the Professional Development Committee presented a management leadership seminar and expects to repeat the program next year. The committee is also responsible for the conducting of the Clemson correspondence course. Information of this correspondence course and on the Kerri correspondence course is in the appendix.

TABLE 1

COMMUNITY COLLEGES IN THE NINE-COUNTY SAN FRANCISCO BAY AREA

COUNTY	COMMUNITY COLLEGE	Quarter or Semester	PROGRAMS OF INTEREST WASTEWATER COLLECTION AND TREATMENT: Environmental Health Technology	Environmental Technician	Chemical Technician	Water Quality Control Technology	Public Administration Management	Supervision
Alameda	Alameda	Q						
	Chabot	Q				X	X	X
	Laney	S				X		X
	Merritt	S	X					X
	No. Peralta	Closing June 1975						
	Ohlone	Q		X				X
Contra Costa	Contra Costa	S	X				X	X
	Diablo Valley	S						
	Los Medanos	S					X	X
Marin	Indian Valley	S						
	Marin	S						
Napa	Napa	Q						X
San Francisco	San Francisco City	S			X			X
	S. F. Community College District					X		X
San Mateo	Canada	S		X			X	
	San Mateo	S						X
	Skyline	S						
Santa Clara	De Anza	Q						
	Foothill	Q						
	Gavilan	Q		X				X
	San Jose City	S						X
	West Valley	S						X
Solano	Solano	S				X	X	X
Sonoma	Santa Rosa	S						X

A correspondence course on sewer line maintenance is being developed by Dr. Ken Kerri and will be available at the end of this year.

Of the twenty-four colleges in the nine-county Bay Area, seven have evening programs with courses on wastewater treatment. They are Chabot, Laney, Ohlone, Contra Costa, San Francisco Community College District, Canada, and Solano Colleges. Gavilan has a program listed but does not have classes this year because of the lack of student interest. The different titles indicate the different emphases of the programs. The programs at Merritt and San Francisco City College are during the day so are of marginal use to employees.

The programs in public administration management and supervision are also included on Table 1. More specific information on the programs, and the addresses and phone numbers of the community colleges are in the appendix.

The list of instructors in the appendix was derived from the JEC report, CWPCA - Bay Section Professional Development Committee and the community colleges. There are five instructors in line maintenance, fourteen in operations and ten from consulting firms.

The funding for vocational education programs is through the community collegs or high schools in the area. To get funding for programs outside these established institutions, application would be made to the State Water Resources Control Board in Sacramento or the Environmental Protection Agency in San Francisco.

In-plant Interviews

Twenty-five of the seventy-two wastewater treatment agencies in the Bay Area were visited during January, 1975. The superintendents and managing engineers and as many operation and maintenance employees as were available were interviewed. The superintendents were asked about education and training

policies, recruiting and hiring procedures. job qualifications, number of shifts, and job benefits. The fifty-seven operators, maintenancemen, and laboratory personnel were asked about courses they had taken, how they found their job, and if they had a state operators certificate. The results are incorporated in the data analysis and tabulated in the appendix.

Training Programs Needed

To determine the programs needed, three procedures were followed. First, a survey was done of the wastewater employees taking courses in December, 1974 and January, 1975. The profile from this survey was compared to the profile done on the general population of wastewater collection and treatment employees to determine if the persons taking clases were of a select group. The students were younger, better educated and higher paid than the general population.

The second procedure was to ask the employees in the interviews what courses they had taken. Thirty-nine percent had taken correspondence courses and 21% had taken courses at community colleges. Rotating shifts and lack of available local courses were sited as the problems. Current programs show that no courses are given in Marin, Sonoma, Napa, and Santa Clara counties.

The third procedure was to ask the employees what they wanted.
From the completed personal data survey forms, 432 employees made the following choices: 43% wanted courses on unit processes, 57% wanted to upgrade their position as compared to 29% wanting education points or credit toward a CWPCA maintenance certificate, 34% wanted the program at the treatment plant and 38% at community colleges, and 57% wanted courses in the evening while 35% wanted them in the daytime.

Summary

This survey was done in the middle of major changes in the wastewater field. Some subregions of the Bay Area are still in the study stage of implementing a higher level of wastewater treatment and many agencies are in the middle of construction. In wastewater collection programs are just beginning to study the problems. The projections of manpower needs in the next ten years will be influenced by the release of the Environmental Protection Agency funds for the construction of more advanced treatment plants in this area. In 1975 an estimated 1401 persons are working in wastewater collection and treatment. The projections indicated an increase of 337 in five years and additional 183 in the following years. The estimates are probably low.

Training programs are in the state of change also. The state operator certification program is in the process of being established, with the schedule of compliance from September, 1974, to September, 1976. This mandatory program requires the operator to take courses to qualify for a minimum Grade I. To provide for this required training, a two-year community college curriculum for water and wastewater treatment is being developed and will be available in July of this year. Courses are available except in the north bay counties and Santa Clara County, but the courses are only in fundamentals. Courses in unit processes and advanced treatment are needed.

The trend in the wastewater field is apparent. More advanced treatment and mandatory operator certification will require the employee to seek more training and education; but the employer cannot expect the employee to do this on his own. The employer must take an active role in supporting and providing training programs in his locale.

RECOMMENDATIONS

1. The basic policy of Bay Area Sewage Services Agency and the California Water Pollution Control Association in implementing programs should be to maintain the diversity of training and provide for the coordination of local activities and for the dissemination of information. The programs outlined below are of those to be continued and those to be initiated.

2. During the in-plant interviews, many of the operators pointed out that a course held in the late afternoon, when the shifts change, would be more convenient than an evening course. Therefore, at a community college one course that is already available should be offered at 4:00 or 5:00 instead of the evening. This change in schedule would be monitored through class evaluation forms.

3. The Saturday short schools and the management leadership seminars put on by the CWPCA-SF Bay Section should be continued. The problem of publicity would be overcome by the initiation of a central clearinghouse that is discussed below. The seminar format could be used and expanded to workshops for instructors on curriculum implementation and evaluation and courses evaluation, for engineers and operators on design and operation problems and the writing of operations and maintenance manuals, for city managers and superintendents for budgeting and staffing. Evaluation forms should be used for all programs to build a constant feedback system.

4. The BASSA unit process trainer program, the only current program on unit processes in the Bay Area, should be expanded to incorporate more processes and more complex procedures. This program is more meaningful for those persons more oriented toward processes than theory.

5. Whereas the present community college programs have the courses on fundamentals, they do not have courses on unit processes and maintenance. The CWPCA and California Section-AWWA Joint Education Committee curriculum, which will have these course outlines, should be distributed and incorporated into these programs.

6. The programs to be initiated by BASSA should include a central clearinghouse. The evidence for the need for this program came from the in-plant interviews and the CWPCA Professional Development Committee experience. The common method of publicizing courses has been through community college catalogs or college offices, the advisory committees to the program and the CWPCA Newsletter sent only to members. If any one person, whether director of vocational education or beginning employee, needed information, it would be at one telephone number. The clearinghouse is for collecting information as well as giving it out. Areas to be included would be:

   - job openings
   - persons looking for jobs
   - courses--community college, BASSA, CWPCA, San Marcos, Regional Occupational Programs
   - instructors
   - course resources
   - equipment
   - all current wastewater employees--address, job, operator or CWPCA maintenance certificate
   - agencies--class, treatment process, superintendent

7. A mailing list of the water and wastewater agencies should be put together and used for dissemination of information. A process of updating the list would be included in the files.

8. The San Marcos Training Center program that will be offered everywhere in the State starting in August or September should be coordinated and publicized through the central clearinghouse.

9. In conjunction with the clearinghouse, a reference library would be set up at the BASSA offices containing course references, past course curricula, project reports, technical information for individuals to use at BASSA.

10. As part of the dissemination of information, a periodic newsletter could be sent to all agencies and institutions involved in wastewater and training.

11. From the course information in the files, data could be sent to SWRCB for evaluation as to education points. Right now that process does not happen as is verified by the comparison of the courses evaluated in the state operator certification program in the appendix and the listing of programs in the Bay Area in the data analysis section. The update of their files on agencies and individuals could be sent also.

12. To update and evaluate ongoing programs, trainee or student evaluations would be done on each program and incorporated into the files. This information would be available to new students and to instructor workshops and seminars.

13. The clearinghouse would be used as a link to the community colleges to facilitate coordination and also to the advisory committees for input into the programs they have in their area. BASSA would work through the clearinghouse to coordinate all local programs. Here also BASSA could be the facilitator of establishing programs where needed by helping to organize the advisory committee.

14. A further program to be developed is an operator-in-training/on-job-training curriculum. This program would not duplicate the JEC curriculum but compliment it. Part of the JEC program is 96 hours of in-plant training. This program

would be part of that but more. Five in-plant training programs were found in the Bay Area. With the more complicated collection and treatment processes being introduced, more programs of on-job training will be needed. BASSA, with funding from Environmental Protection Agency, would contract to develop a curriculum for operator-in-training/on-job-training. This curriculum would be a schedule of individual study and group study programs with training aides such as videotapes on unit processes, lab procedures, plant maintenance and sewer maintenance.

15. To facilitate the operator-in-training/on-job-training program, BASSA would recruit and coordinate employees interested in teaching using the San Marcos instructor courses or the "Sixty Clock Hour Course" making available more qualified instructors for community college programs, adult evening schools or for their own agencies.

16. This on-job-training program would be coordinated with the community college courses using a suggested schedule of courses for individuals to take.

17. The link between BASSA and the wastewater collection and treatment personnel should be maintained as an in-depth check on programs and effectiveness of communications systems. In-plant interviews would be the mechanism, perhaps with twenty-five plants visited each year so that all agencies would be visited every three years.

18. Because of the intensity of change in the wastewater field during this time period in which this survey was done, the survey should be repeated in three to five years with the changes suggested in the methodology section. This survey would check the effectiveness of the programs and of the projections done on the future manpower needs.

DATA ANALYSIS

Manpower

The number of employees listed under the categories of management, operation, plant maintenance, laboratory and sewer maintenance were obtained from the completed questionnaires and from telephone calls to those agencies not returning the survey forms. The catagories are defined as follows:

management - superintendent, assistant superintendent

operation - operator, foreman, shift supervisor

plant maintenance - maintenance superintendent, mechanic, painter, electrician

sewer maintenance - lineman, laborer, foreman, supervisor, equipment operator, maintenanceman

laboratory - chemist, lab technician, lab assistant

All seventy-two agencies treating wastewater responded to the survey and telephone calls so that for the categories of management, operation, plant maintenance and laboratory, all the present employees were counted.

The employees in sewer line maintenance were not as well covered by the survey. The difficulties were that eight sanitary districts and twenty cities which did collection only did not receive survey forms because they were not on the mailing list. Of the seventy-two forms sent out to wastewater agencies, sixteen were routed only to the wastewater treatment plant superintendent in an agency, not to the maintenance supervisor also. Even with the information of agencies missed, the number of employees in sewer line maintenance missed by this survey would be difficult to judge because some districts and cities contract the line maintenance to private companies and for some cities the maintenance employees do general public works maintenance. In either situation the employees would not be counted in this survey.

TABLE 2

NINE-COUNTY SAN FRANCISCO BAY AREA[a]

WASTEWATER COLLECTION AND TREATMENT WORKFORCE

COUNTY	YEAR	MANAGEMENT	OPERATORS	PLANT MAINTENANCE	LABORATORY	SEWER MAINTENANCE
ALAMEDA	1975	16	120	46	9	111 + (13)
	1980	18	166-170	59-63	27	134-138
	1985	18-20	168-176	62-71	29-31	142-150
CONTRA COSTA	1975	15	63	20	10	67
	1980	16-17	72-78	34-35	14-15	79-83
	1985	15-19	75-93	36-40	14-18	90-99
MARIN	1975	10	37	4	3	22+(4)
	1980	10-11	42-47	9	7	28-31
	1985	11-15	46-60	12-13	7-8	28-37
NAPA	1975	2	10	1	2	15
	1980	3	20	2	5	22-23
	1985	3	20-21	3	5	22-24
SAN FRANCISCO [b]	1975	3	103		18	137
	1980	3	103		18	137
	1985	3	103		18	137
SAN MATEO	1975	13	66	9	11	39+(24)
	1980	14	93-102	21	15	60-70
	1985	14-22	94-119	22-26	16-22	63-89
SANTA CLARA	1975	7	72	62	14	25+(51)
	1980	13	91	80	19	76-96
	1985	14	106-107	101-102	23	76-120
SOLANO	1975	4	37	3	6	11+(8)
	1980	5	44-45	12	9	18
	1985	5	44-46	16	9	22
SONOMA	1975	7	29	8	5	19
	1980	6	43-44	16	5	23
	1985	6-8	47-52	18-20	8	28-30

(a) Estimated total of 1401 employees in wastewater in 1975

(b) Operators do plant maintenance also.

The estimate of the number missed was based on the size of Stege Sanitary District of five and Hayward sewer maintenance crew of eight; and it was assumed that the twelve smaller cities had general maintenance crews and would not be counted. On these assumptions, the total number of employees currently working are, by county

Alameda 325 [312 + (13)]	San Mateo 162 [138 + (24)]
Contra Costa 175	Santa Clara 231 [180 + (51)]
Marin 80 [76 + (4)]	Solano 69 [61 + (8)]
Napa 30	Sonoma 68
San Francisco 261	

The numbers in parentheses are the estimates of sewer line maintenance employees.

Future Projections

The projections of the workforce in the next ten years are based 40 to 75% on values from the completed survey forms. The extrapolations are based on the BASSA project coordination file and on the present number of employees. The low estimate was calculated as no change from the present number for those agencies that had no approved plans. The high estimate was based on a 5% increase per year from the present number.

Table 2 gives the current and extrapolated number of employees by county for 1975, 1980, and 1985. The numbers in parentheses are the estimates on present line maintenance employees. From these ranges the average increase in manpower for the nine counties would be

	management	operation	plant maintenance	laboratory	sewer maintenance	total
1975-1980	11	150	82	41	53	337
1980-1985	10	52	45	17	59	183

These estimates are low because many of the present plants have primary treatment and the future treatment plants will have secondary processes, which require more personnel.

When considering the turnover rate, one factor to include is that 23% of the wastewater employees in the nine counties worked in a public agency on their

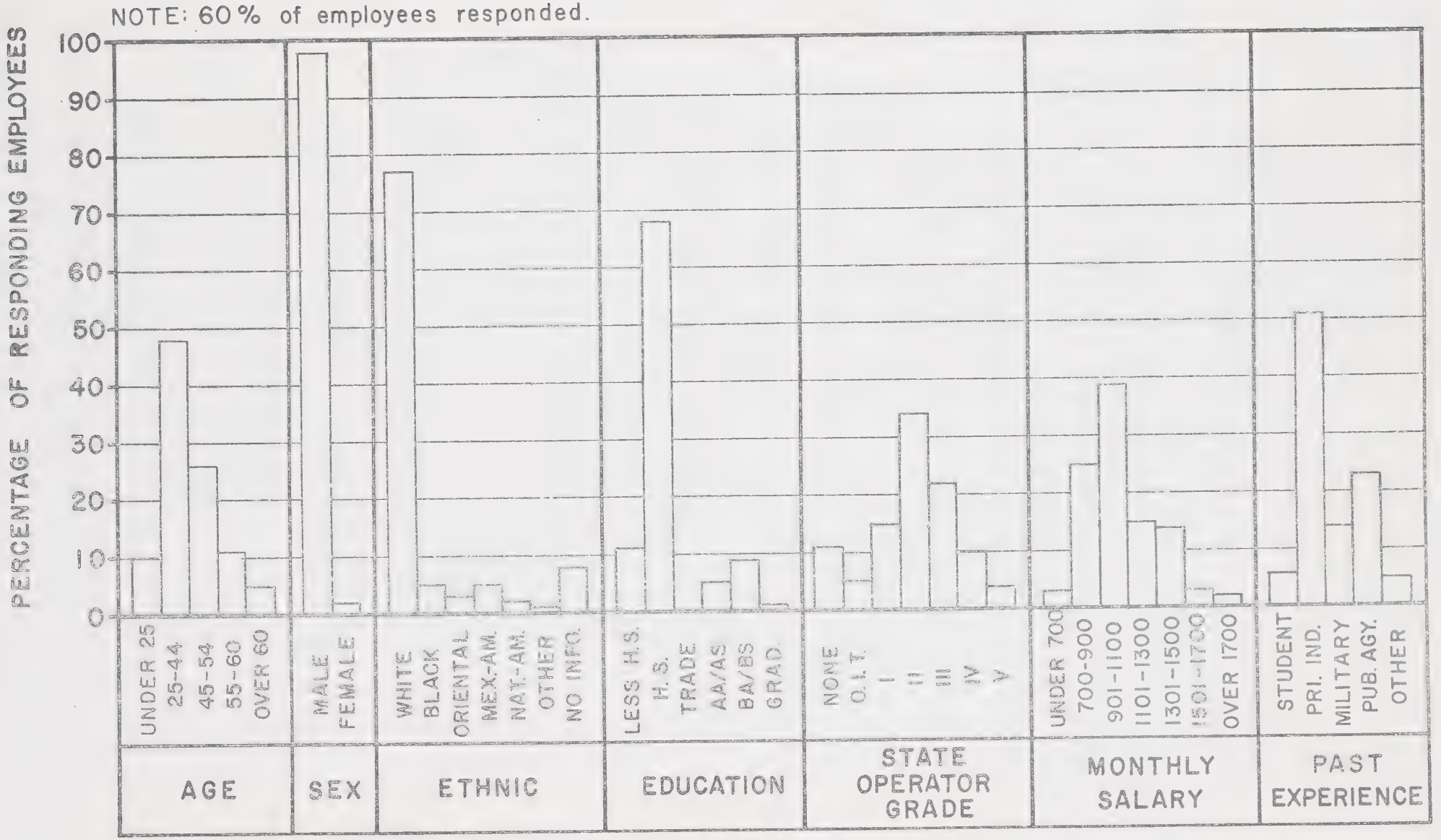
last job. Eleven of the fifty-seven (19%) operators interviewed had worked at another treatment plant previously. These findings may be an indication that the operators are moving from one wastewater treatment plant to another. In fact, several commented that to get a promotion, the operator usually had to move.

From the age profile done on employees, 5% (70) of the workforce were in the "over 60 years" age group and 11% (154) more were in the "55 to 60 years" group. These persons will be retiring over the next five and ten years and will be replaced, generally by promotion from within the agency. More new persons will be needed. Both the new employees and the moves made by experienced employees could be facilitated by a job information service.

The Employee Profile - FIGURE 2

The employee profile was derived from the forms completed by those in both collection and treatment. The profile was done to determine the characteristics of this workforce and to compare this general profile with the profile done on employees taking wastewater courses. The sixteen women counted on this survey were in operations and the laboratory. Another point to clarify is that 39 of the 60 operators that did not have state certification also did not have a year of experience in the field as is required to qualify to take the certification examination.

The cover form of the survey packet asked for the percent of employees covered by the civil service merit system and the number represented by a labor union or employee association since these factors influence hiring procedures and job qualifications. Labor unions can influence the standards of entry level hiring and the type of on-job-training. The civil service system sets forth hiring procedures also including exams and interviews by a board. Employee benefits are set or influenced by the civil service system. Sick leave and the amount of paid vacation were the same at all twenty-five treatment plants visited. Tables 3 and 4 show the amount of use of the civil service system and the labor representation of those agencies covered by the survey in the nine counties.



PROFILE OF EMPLOYEES IN WASTEWATER COLLECTION AND TREATMENT IN NINE-COUNTY S.F. BAY AREA

FIGURE 2

TABLE 3
USE OF THE CIVIL SERVICE SYSTEM

TREATMENT AGENCIES

COUNTY	TOTAL #	CIVIL SERVICE	NONE	NO INFO
ALAMEDA	8	6	1	1
CONTRA COSTA	12	7*	1	2
MARIN	10	2	7	1
NAPA	5	0	4	1
SAN FRANCISCO	2	2	0	0
SAN MATEO	15	7	8	0
SANTA CLARA	4	4	0	0
SOLANO	7	1	3	3
SONOMA	9	5	3	1

COLLECTION SYSTEM AGENCIES

COUNTY	TOTAL #	CIVIL SERVICE	NONE	NO INFO
ALAMEDA	9	5	3	1
CONTRA COSTA	1	1	0	0
MARIN	7	2	0	5
SAN MATEO	2	2	0	0
SANTA CLARA	4	1	1	2

* 2 with partial coverage

TABLE 4
LABOR UNION AND EMPLOYEE ASSOCIATION REPRESENTATION

WASTEWATER TREATMENT & COLLECTION AGENCIES

COUNTY	TOTAL #	100% REPRESENT	PART	NONE	NO INFO
ALAMEDA	17	7	6	2	2
CONTRA COSTA	12	1	5	4	2
MARIN	17	3	1	6	7
NAPA	5	0	0	4	1
SAN FRANCISCO	2	2	0	0	0
SAN MATEO	17	6	4	7	0
SANTA CLARA	8	2	2	2	2
SOLANO	7	0	4	0	3
SONOMA	9	1	5	2	1

Education and Training Programs

This survey cataloged the education and training programs for the wastewater collection and treatment employees in the Bay Area. The institutions covered were high schools, including the Regional Occupational Programs, the California Water Pollution Control Association, the Bay Area Sewage Services Agency, the San Marcos Training Center, community colleges, correspondence courses, colleges, private educational institutions, universities, and the training programs at wastewater treatment plants.

a. High Schools and the Regional Occupational Programs

Two programs are conducted through the high schools in the Bay Area. The program at Livermore is for high school students who take a night course and work part-time at the Livermore treatment plant. The program and course is conducted by the lab technician, Gerry Taylor.

Adult evening courses in public works, which includes sewer line maintenance and wastewater treatment, are conducted once a year with five San Jose school districts. This program is developed by an advisory committee made up of persons working in public works. Courses are initiated if there is a demand. Both of these programs are under the Regional Occupational Programs, which provides training for high school students and for employed adults. The Bay Area has nine local regions that cover several high school districts each. The director of the local region should be contacted to begin courses.

b. California Water Pollution Control Association

The CWPCA is represented by three sections in the San Francisco Bay Area: Santa Clara Valley, San Francisco Bay and Redwood Empire. Each section can organize a professional development committee to conduct programs for training and education in that area. The San Francisco Bay Section Professional Development Committee (PDC) sponsors several programs. Each year ten Saturday short schools are conducted covering the areas of

operations and maintenance. The schedule for this year is included in the appendix for an example of the courses given. The PDC also conducted a management leadership seminar this year and published a syllabus of the papers presented. From the response of the participants, this program will be repeated yearly. The Bay Section PDC has been instrumental in initiating classes at Laney College and with the International Union of Operating Engineers in San Francisco, initiating courses with the San Francisco Community College District. The PDC also conducts the Clemson University correspondence course for treatment plant operators. The Redwood Empire Section has re-established their professional Development committee and efforts are being made to establish communication and coordination between the two sections.

c. Bay Area Sewage Services Agency

BASSA is conducting a training program on activated sludge and anaerobic digestion using a unit process trainer. The six one-month courses on each subject started in January and will continue for the rest of this year.

d. San Marcos Training Center

The San Marcos Training Center, under the SWRCB Office of Operator Training and certification, announced that they will be offering all of the courses listed in their catalog at any location in the state for a minimum number of students. This program will begin in August or September of this year.

e. Community Colleges

Four sources were used to collect the information on community college programs on wastewater and management. They are listed in the appendix. Difficulties in obtaining this information were that some community colleges do not list evening courses in their catalogs and if an inquiry was asked at the wrong office, the information given would be incorrect. A central source of information, as was begun with the CWPCA-AWWA JEC

TABLE 5

LIST OF COURSE TITLES IN WASTEWATER GIVEN IN 1974-1975

Community College	Program	Course Titles
Laney	Water Quality Control Tech.	Environmental Chemistry of Water Pollution Electrical Industrial Instrumentation Microbiology for Operators and Supervisors
Chabot	Water Quality Control Tech.	Contemporary Chemistry Basic Mathematics Technical Math Water Treatment Wastewater Treatment Hydraulics
Merritt	Environmental Health Tech.	Public Health Microbiology Water Sanitation -USN
Ohlone	Environmental Technology	Water Technology Operation of Wastewater Treatment Plants Applied Chemistry of Water and Wastewater Treatment
Contra Costa	Environmental Health Tech.	Introduction to Environmental Pollution and Its Control Biochemical Principles of Sewage Treatment Water Technology
San Francisco Community Col. Dist.	Water Quality Control Tech.	Fundamentals of Wastewater Treatment Basic Water Treatment Practices Math for Wastewater Treatment Plant Operators
Canada	Environmental Technology	Basic Math for Wastewater Operators Chemistry for Wastewater Treatment Plant Operators
Gavilan	Environmental Technology	(not given this year because not enough students)
Solano	Water Quality Control Tech.	Introduction to Water And Wastewater Technology Microbiology for Water and Wastewater Technology Sanitary Chemistry and Microbiology II Water Supply and Wastewater Control Wastewater Treatment Instrumentation and Controls

report is needed; however, procedures for updating the information should be included in that source.

Table 5 lists the community colleges with programs in wastewater and a list of the course titles in each program. These titles show that the courses are on fundamentals, general introduction and instrumentation. The programs do not have more advanced courses in wastewater. CWPCA-AWWA Joint Education Committee is in the process of developing a two-year community college curriculum for water and wastewater treatment personnel which will be available in July of this year. This program will include general education requirements; supportive sciences of mathematics, chemistry, physics, biology and microbiology; and technical education of unit processes, unit operations, safety maintenance and report writing. The development of the technical education curricula will give the employee the opportunity for training in more advanced material in his field.

Programs can be initiated by the persons in the local community college district contacting the directors of vocational education or directors of the evening programs. An advisory committee is then made up of these people working in wastewater collection and treatment. This committee reviews the course content and the choice of instructor and helps publicize the courses. The names of the directors of vocational education of the community colleges of the Bay Area are listed in the appendix.

The funding is available for vocational training programs through the Regional Occupational Programs or the community colleges. Funding for the development of new programs in wastewater are available by grant application to the Environmental Protection Agency, San Francisco. Another source of funding is the comprehensive Employment and Training, CETA This funding is distributed through local prime sponsors out of the manpower

offices of counties or of cities of 100,000 or more population. The program is to train underemployed or unemployed persons for jobs. The act has two parts: one for funding of training programs and one to pay the salary of a public employee for his first year. Most sponsors are flexible and want to see the persons trained to move into a permanent position.

f. Teaching Credentials

Persons who have been working in the field of wastewater collection or treatment for six years and have a high school diploma or equivalent may get a Community College Special Limited Services Credential to teach part-time in vocational education. This credential is good for two years with no renewal. If the individual wishes to continue teaching, he can qualify for a Community College Limited Service Credential by completing the "Sixty Clock Hour Class" put on by the Vocational Education Office in Berkeley, or by completing four semester units on teaching techniques. The two instructor training courses conducted by San Marcos has four semester unit credits form Palomar Community College.

g. Correspondence Courses

Two correspondence course programs on wastewater treatment are available in the Bay Area: The Sacramento State University course, Operation of Wastewater Treatment Plants by Dr. Kenneth Kerri and the Correspondence Course Manual for Water and Wastewater Plant Operators, B, C, and D series by Dr. John Austin, Clemson University. The Clemson course is conducted by CWPCA-Bay Section Professional Development Committee with the books and materials from South Carolina. Specific information on both courses is in the appendix. A correspondence course on sewer line maintenance is being developed by Dr. Kerri and will be available next year.

From the in-plant interviews, 22 of 57 operators, 39%, were using or had used correspondence courses for their educational training. They used the correspondence courses because they worked on rotating shifts and could not attend scheduled classes at a community college. Also, in four counties. no community college courses are available.

h. In-plant Programs

In the Bay Area, five programs of in-plant training have been developed that are not part of construction programs. Hayward has an ongoing program for six new employees that is based on its operation and maintenance manual. It is taught by a retired superintendent on Monday and Friday, eight hours each day. The Livermore Wastewater Treatment Plant has a program for high school students as was mentioned under the High School programs. That evening class can be attended by any of the operators.

Valley Community Services District has a review program in which one person in charge of a unit, such as a chlorinator, trains and checks other employees on that unit. This system is used to instruct new employees and re-educate experienced employees on units other than in their own area of responsibility.

Fairfield-Suisun Sewer District had a program taught by the superintendent and conducted at the plant.

North San Mateo County Sanitation District also has had an in-house program taught by the superintendent. They have been developing an inventory of slides on parts of the plant machinery.

i. Other Educational Opportunities

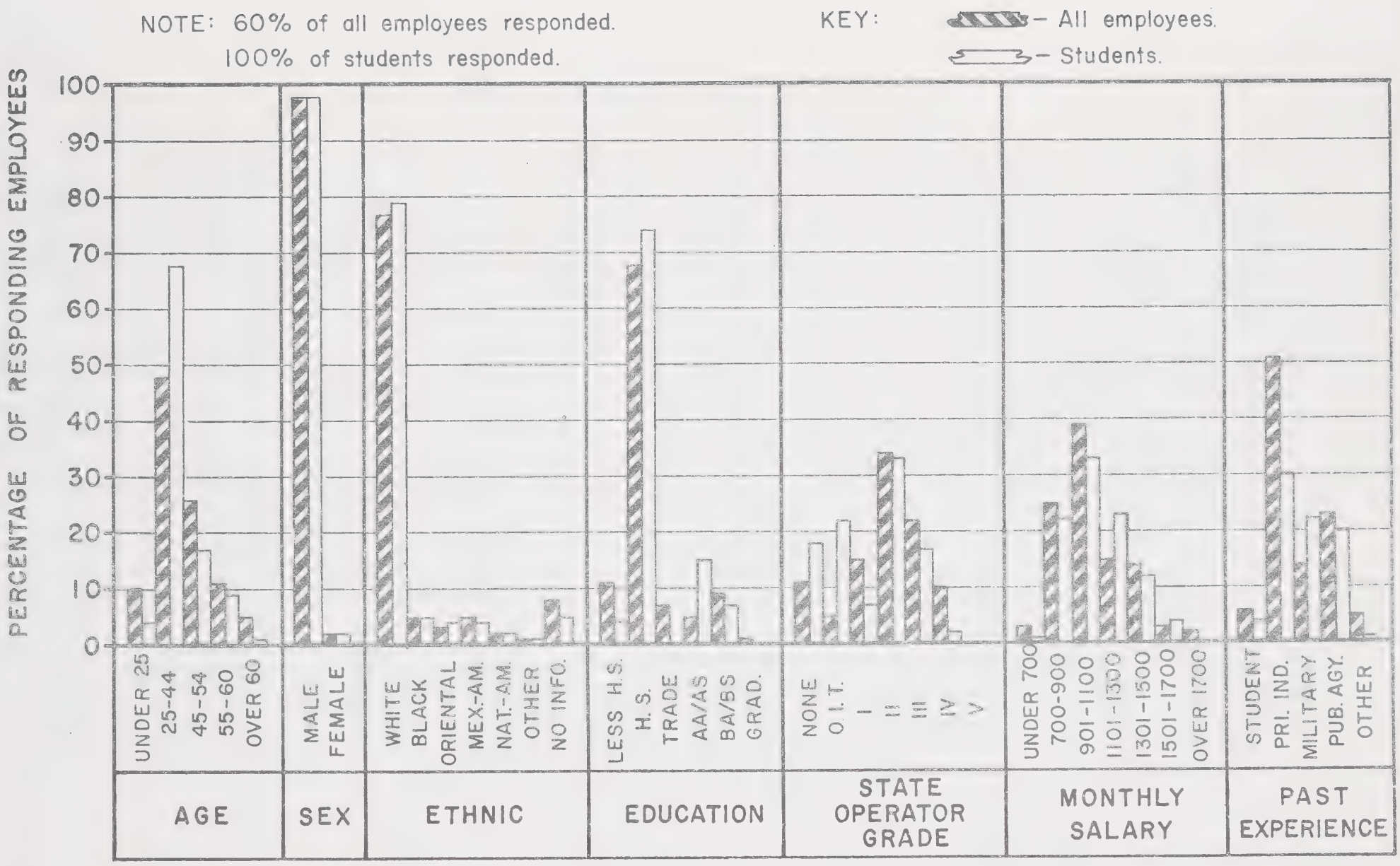
Colleges, universities and private educational institutions in the Bay Area were contacted to determine what programs they had that would be of interest to employees in wastewater. Only programs in management are

listed in the appendix along with civil and sanitary engineering programs at universities. Any other programs would be of individual interest and thus left to the individual to find.

Educational Programs Needed

To determine what programs were needed, three procedures were followed. First, 134 student questionnaires were sent out to and returned from the students in the nine community college courses that were being conducted during December 1974 or scheduled to begin in January, 1975. The results of this survey were compared with the general population of Bay Area Wastewater collection and treatment employees to determine who were taking the courses offered. The results are shown on the figure 3 . Not shown on the figure is that 82 of the students, 61%, were working in wastewater treatment. No difference was seen in the sex and ethnic profile. The past experience profile is misleading since 23% of the students did not answer that question; however, the relatively large percent of military persons is due to three of the nine courses being at Solano College, near to Travis Air Force Base. The figure shows the students have a higher salary, higher education and are younger that the general population profile. Another point from the student survey is that 60% of the students already ahd Grades I through IV in state operator certification. It seems that many of the students are not attending classes just to meet state requirements. The results of the training programs choices supports this conclusion.

The second procedure to determine what programs were needed was to ask the 57 employees who were interviewed during the in-plant interviews what courses they had taken. The results are tabulated below:



COMPARISON OF ALL EMPLOYEES AND EMPLOYEES ENROLLED IN CLASSES DEC. 1974 - JAN. 1975

FIGURE 3

Courses	# Participating	Percent
• correspondence	22	39%
• community college courses	12	21
• on-job training	3	5
• CWPCA short school & conferences	6	11
• BASSA UPT course	3	5
• other	6	11

A significant finding was that rotating shifts at work makes it difficult for an employee to attend a regularly scheduled class. In addition, no wastewater courses are given in Marin, Sonoma, Napa, and Santa Clara Counties, making it difficult for employees in these areas to attend classes.

The third procedure to determine what programs were needed was to ask the employees what they wanted on their questionnaires. Those persons who filled out their own personal data forms had four choices on four questions: (1) what subject, for operators: Fundamentals, unit processes, maintenance and other; and for collection: pumps and lift stations, preventive maintenance, electrical equipment, and other; (2) what purpose: entry level, upgrade position, certification points, and civil service, (3) location: a wastewater treatment plant, local high school, local community college, and other; (they were also asked county preference); and (4) at what time: morning, afternoon, evening and Saturday.

In the directions to fill out the questionnaire, the areas were defined as follows.

Fundamentals -
- math
- chemistry
- hydraulics
- laboratory
- report writing
- microbiology
- electricity
- safety

Unit Processes -
- general instruction for WWTP operators
- sedimentation
- filtration
- biological (aerobic)
- biological (anaerobic)
- chemical
- solids handling and disposal
- carbon absorption
- disinfection
- control and monitor of industrial wastes
- activated sludge

Maintenance -
- instrumentation
- pumps and lift stations
- engines
- preventive maintenance
- lubrication
- electrical equipment
- general housekeeping

The purposes were defined as follows:

Entry level---------- For those who have just begun work or those who hope to enter this field.
Upgrade---------- For those employess who wish to advance in this field.
Certification points-- CWPCA certification program for persons in sewer maintenance or state operator certification.
Civil Service--------- For employees who take civil service exams for advancement.

The rest of the choices are self-explanatory.

Results are tabulated for the nine counties in Table 6. The graphs of the choices are done by county and included in the appendix.

TABLE 6

TRAINING PROGRAM CHOICES

		64 WWT PLANT SUPERINTENDENTS	432 COLLECTION & TREATMENT PERSONNEL
SUBJECT	fundamentals	15	72
	unit processes	37	185
	maintenance	13	123
	other	6	37
PURPOSE	entry	9	30
	upgrade	46	248
	certification points	20	115
	civil service	3	8
LOCATION	Wastewater Treatment plant	23	145
	High School	10	87
	Community College	30	165
	other	3	20
TIME	morning	6	81
	afternoon	15	69
	evening	43	248
	Saturday	2	17

County Location(collection and treatment personnel)

Alameda	85	Napa	22	Santa Clara	5*
Contra Costa	47	San Francisco	83	Solano	17
Marin	35	San Mateo	51	Sonoma	17

From these data the preferences for employees are for unit processes, to upgrade position, to be held at the plant or local college in the evening.

* Does not include input from Palo Alto and San Jose-Santa Clara plants.

Conclusions

An estimated 1401 persons work in wastewater collection and treatment in the nine-county San Francisco Bay Area. In the next ten years major construction in upgrading treatment plants and population growth will change that number. A low estimate of 520 more will be needed because of plant expansions and an estimated 224 of the present workforce will be retiring in the next ten years. To facilitate placement of persons and training of employees a central clearinghouse should be developed. With the continued programs of a variety of training opportunities coordination is needed, but the initiation of community college programs should be done by the local participating wastewater personnel. The development of a curriculum for water and wastewater treatment personnel by CWPCA-AWWA Joint Education Committee will be a major contributing factor to begin these courses. With the more complicated processes of advanced treatment, a more formal structure of on-job training is needed. A program can be developed for a superintendent or chief operator to follow with supplements of videotape programs on unit processes, lab procedures, plant maintenance, and sewer maintenance. The superintendent could add the peculiarities of the plant to individualize the program. A schedule of community college courses could be incorporated as one method of training.

The schedule of compliance for state operator certification is September 1976 for all operators in wastewater treatment plants. Programs are needed to meet the requirements for education points.

Because of the developments in this field the major thrust of the second phase of this employee training program should be in collecting and disseminating information on jobs and training programs, and in developing an operator-in-training/on-job-training program.